Catalogue no. 88F0006XIE — No. 016
ISSN: 1706-8967
ISBN: 0-662-41612-0

Working Paper

Science, Innovation and Electronic Information Division

Functional Foods and Nutraceuticals: The Development of Value-added Food by Canadian Firms

by Jacqueline Tebbens

Science, Innovation and Electronic Information Division (SIEID)
7-A, R.H. Coats Building, Ottawa, K1A 0T6

Telephone: 1 800 263-1136

Statistics Canada Statistique Canada

Canada

106-06751/

How to obtain more information

For information on the wide range of data available from Statistics Canada, you can contact us by calling one of our toll-free numbers. You can also contact us by e-mail or by visiting our website.

National inquiries line	1 800 263-1136
National telecommunications device for the hearing impaired	1 800 363-7629
Depository Services Program inquiries	1 800 700-1033
Fax line for Depository Services Program	1 800 889-9734
E-mail inquiries	infostats@statcan.ca
Website	www.statcan.ca

Information to access the product

This product, catalogue no. 88F0006X!E, is available for free. To obtain a single issue, visit our website at www.statcan.ca and select Our Products and Services.

Standard of service to the public

Statistics Canada is committed to serving its clients in a prompt, reliable and courteous manner and in the official language of their choice. To this end, the agency has developed standards of service which its employees observe in serving its clients. To obtain a copy of these service standards, please contact Statistics Canada toll free at 1 800 263-1136. The service standards are also published on www.statcan.ca under About Statistics Canada > Providing services to Canadians.

Symbols

The following standard symbols are used in Statistics Canada publications:

. not available for any reference period
.. not available for a specific reference period
... not applicable
0 true zero or a value rounded to zero
0^s value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
^{p} preliminary
^{r} revised
x suppressed to meet the confidentiality requirements of the *Statistics Act*
^{E} use with caution
F too unreliable to be published

Note
Due to rounding, components may not add to the totals.

Statistics Canada
Science and Innovation Surveys Section
Science, Innovation and Electronic Information Division (SIEID)

Functional Foods and Nutraceuticals: The Development of Value-added Food by Canadian Firms

2002

Published by authority of the Minister responsible for Statistics Canada

© Minister of Industry, 2005

All rights reserved. The content of this publication may be reproduced, in whole or in part, and by any means, without further permission from Statistics Canada, subject to the following conditions: that it is done solely for the purposes of private study, research, criticism, review, newspaper summary, and/or for non-commercial purposes; and that Statistics Canada be fully acknowledged as follows: Source (or "Adapted from", if appropriate): Statistics Canada, name of product, catalogue, volume and issue numbers, reference period and page(s). Otherwise, no part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopy, for any purposes, without the prior written permission of Licensing Services, Marketing Division, Statistics Canada, Ottawa, Ontario, Canada K1A 0T6.

September 2005

Catalogue no. 88F0006XIE, no. 016

ISSN: 1706-8967
ISBN: 0-662-41612-0

Frequency: occasional

Ottawa

Cette publication est disponible en français sur demande (nº 88F0006XIF au catalogue).

Note of appreciation

Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued cooperation and goodwill.

Contacts for more information

Allison Miranda, Senior Market Development Officer
New Foods and Technologies
Agriculture and Agri-Food Canada
930 Carling Ave, Room 597
Ottawa ON K1A 0C5
Tel: (613) 759-7702 Fax: (613) 759-7480
E-mail: mirandaa@agr.gc.ca

Brian Rattray
New Foods and Technologies
Agriculture and Agri-Food Canada
930 Carling Ave, Room 597
Ottawa ON K1A OC5
Tel: (613) 759-6048 Fax: (613) 759-7480
E-mail: rattraybl@agr.gc.ca

Jacqueline Tebbens or Alan Bulley
Analysis and Compendia Publishing
Communications and Library Services
R.H. Coats Building, 10th Floor, Section O
Statistics Canada
Ottawa ON K1A OT6

How to obtain more information

National inquiries:	1 800 263-1136
E-mail inquiries :	**infostats@statcan.ca**

The science and innovation information program

The purpose of this program is to develop **useful indicators of science and technology activity** in Canada based on a framework that ties them together into a coherent picture. To achieve the purpose, statistical indicators are being developed in five key entities:

- **Actors**: are persons and institutions engaged in S&T activities. Measures include distinguishing R&D performers, identifying universities that license their technologies, and determining the field of study of graduates.
- **Activities**: include the creation, transmission or use of S&T knowledge including research and development, innovation, and use of technologies.
- **Linkages**: are the means by which S&T knowledge is transferred among actors. Measures include the flow of graduates to industries, the licensing of a university's technology to a company, co-authorship of scientific papers, the source of ideas for innovation in industry.
- **Outcomes**: are the medium-term consequences of activities. An outcome of an innovation in a firm may be more highly skilled jobs. An outcome of a firm adopting a new technology may be a greater market share for that firm.
- **Impacts**: are the longer-term consequences of activities, linkages and outcomes. Wireless telephony is the result of many activities, linkages and outcomes. It has wide-ranging economic and social impacts such as increased connectedness.

The development of these indicators and their further elaboration is being done at Statistics Canada, in collaboration with other government departments and agencies, and a network of contractors.

Prior to the start of this work, the ongoing measurements of S&T activities were limited to the investment of money and human resources in research and development (R&D). For governments, there were also measures of related scientific activity (RSA) such as surveys and routine testing. These measures presented a limited picture of science and technology in Canada. More measures were needed to improve the picture.

Innovation makes firms competitive and we are continuing with our efforts to understand the characteristics of innovative and non-innovative firms, especially in the service sector that dominates the Canadian Economy. The capacity to innovate resides in people and measures are being developed of the characteristics of people in those industries that lead science and technology activity. In these same industries, measures are being made of the creation and the loss of jobs as part of understanding the impact of technological change.

The federal government is a principal player in science and technology in which it invests over five billion dollars each year. In the past, it has been possible to say only *how much* the federal government spends and *where* it spends it. Our report **Federal Scientific Activities, 1998 (Cat. No. 88-204)** first published socio-economic objectives indicators to show *what* the S&T money is spent on. As well as offering a basis for a public debate on the priorities of government spending, all of this information has been used to provide a context for performance reports of individual departments and agencies.

As of April 1999, the Program has been established as a part of Statistics Canada's Science, Innovation and Electronic Information Division.

The final version of the framework that guides the future elaboration of indicators was published in December, 1998 (**Science and Technology Activities and Impacts: A Framework for a Statistical Information System,** Cat. No. 88-522). The framework has given rise to **A Five-Year Strategic Plan for the Development of an Information System for Science and Technology** (Cat. No. 88-523).

It is now possible to report on the Canadian system on science and technology and show the role of the federal government in that system.

Our working papers and research papers are available at no cost on the Statistics Canada Internet site at http://www.statcan.ca/cgi-bin/downpub/research.cgi?subject=193.

Table of Contents

Highlights 9
Acknowledgments 10
Background 11
What are functional foods and nutraceuticals? 12
Functional food and nutraceutical activities 12
- Description of firms 12
- Participation in functional food and nutraceutical activities 13
- Product lines 14
- Ingredients sourced in Canada and abroad 15

Distribution of products 15
Exporting products 16
- Export sales/revenues 16
- Export destinations 16
- Exported products 18

Business practices 19
- Ownership 19
- Partnerships 19
- Contracting out 20

Raising capital 21
Intellectual property 22
Research and development 22
Impact of regulations 23
Human Resources 24
Challenges for the future 25
Bibliography 26
Methodology 27
Catalogued publications 28

List of tables and charts

Table 1: Participation in functional food and nutraceutical activities, 2002 13
Table 2: Participation of firms, by type of functional food or nutraceutical, 2002 14
Chart 1: Source of ingredients, 2002 15
Table 3: Total export revenues and total functional food and nutraceutical export revenues, 2002 16
Table 4: Countries or regions where functional foods and nutraceuticals were exported, 2002 17
Table 5: Countries or regions of interest in 2002 for export of functional foods and nutraceuticals in 2003 and 2004 18
Table 6: Exported functional food and nutraceutical products, 2002 19
Table 7: Ownership structure of firms engaged in functional food and nutraceutical activities, 2002 19
Table 8: Reasons for forming partnerships, 2002 20

Table 9: Contracting out of functional food and nutraceutical related activities, 2002 20
Table 10: Sources of raised capital, 2002 21
Table 11: Capital raised, 2002 22
Table 12: Purpose for raising or attempting to raise capital, 2002 22
Table 13: Firms' perceptions of how changing compositional and labelling regulations to match U.S. standards would impact areas of business, 2002 24
Table 14: Firms with employees who participate in functional food and nutraceutical related activities, by firm size, 2002 24
Table 15: Human resource competencies needed for unfilled functional food and nutraceutical positions, 2002 25

Highlights

- In 2002, an estimated 294 firms in Canada engaged in activities with functional food and nutraceutical products. Ontario counted 75 firms, Quebec and British Columbia each 72, and Saskatchewan 33[E].[1] One-third (37%) of firms had fewer than 10 employees.

- More firms were engaged in only nutraceutical activities (46%) than in only functional food activities (28%), and just over one-quarter of firms were involved in both. Half of the firms (51%) were engaged in the production, distribution or sales of plant-based nutraceuticals.

- Wholesalers were the most commonly used distribution channel (61% of firms). Over half of the firms surveyed (57%) indicated that they exported their products. One-quarter of firms sold products for export only.

- Three-quarters of firms (75%) classified themselves as private corporations.

- One-third (37%) of firms invested in research and development of nutraceuticals and one-third (34%) invested in research and development of functional foods.

- Over 60% of all firms believed that the ability to use claims about reducing the risk of diseases, generic health claims and structure-function specific claims would have a positive impact on sales.

1. The symbol [E] indicates a standard error of between 7.5% and 14.99% or a coefficient of variation (CV) between 15.00% and 29.99%. When the figure is not accompanied by a symbol, the standard error is between 0 and 7.5% or the CV is between 0 and 14.99%. Some data with a higher standard error or CV are precise enough for some purposes.

Acknowledgments

Members of the Steering Committee for the Development of The Functional Foods and Nutraceuticals Survey:

Agriculture and Agri-Food Canada
David Culver
Edward Farnworth
Patti Miller
Ahmed Mushtaq
Allison Rodriguez Miranda
Margaret Zafiriou

Statistics Canada
Yves Gauthier
Shelley Harman
Antoine Rose
Patti Wunsch

Saskatchewan Nutraceutical Network
Kelley Fitzpatrick, President (former)

For their assistance in developing this publication, the author would like to thank:

Agriculture and Agri-Food Canada
Allison Rodriguez Miranda
Brian Rattray

Statistics Canada
Alan Bulley
Christian Houle
Antoine Rose
Patti Wunsch

Background

Agriculture and Agri-Food Canada (AAFC), in consultation with industry representatives, recognized the need to conduct The Functional Foods and Nutraceuticals Survey in Canada. The survey was designed to provide a benchmark measurement of the industry and a better understanding of the scope and nature of the sector.

AAFC held a think tank session in February 2002 to begin the process of determining which information requirements of government and industry stakeholders could be obtained from a survey, and to discuss data collection and analysis as well as distribution of the information to end users.

AAFC and Statistics Canada designed the survey instrument, and the survey was carried out in the spring of 2003 for the 2002 reference year. AAFC plans to conduct the survey every two years for purposes of tracking the development of functional foods and nutraceuticals over time—in other words, to enable analysis of trends and growth by categories. The next iteration of the survey is scheduled for 2005 for the 2004 reference year.

What are functional foods and nutraceuticals?

Functional foods are food components that, according to Health Canada,[2] provide demonstrated physiological benefits or reduce the risk of chronic disease, above and beyond their basic nutritional functions. Tomatoes with enhanced lycopene levels and foods with added soluble fibre, for example, are functional foods. According to AAFC, the following are examples of functional food products produced by Canadian companies: milk, cheese and eggs that are all enriched with omega-3 fatty acids; yogurt enhanced with live active cultures (probiotics); fruit juices and drinks with increased antioxidant levels; cereals and grains such as wheat, oat, barley and fenugreek products with enhanced amounts of dietary fibre; modified fatty acid vegetable oils; and vegetable proteins from soy, canola and hemp, legumes and fruit products.[3]

A nutraceutical, according to Health Canada[2], is a product that is isolated or purified from foods that is generally sold in medicinal forms not usually associated with food, such as powders, tablets or capsules. It is demonstrated to have a physiological benefit, or to provide protection against chronic disease. AAFC describes nutraceuticals as products extracted, purified or produced from a plant, animal or marine source (e.g. antioxidants from blueberries, elk velvet, fish oils), or produced from dried, powdered, or pressed plant material, such as ginseng. Omega-3 and lycopene capsules are examples of nutraceutical products that are sold in Canada.[3]

Functional food and nutraceutical products represent a value-added growth opportunity for the Canadian agri-food industry, both domestically and internationally. The market is driven by the aging population, rising health care costs, advances in food technology and nutrition as well as a growing consumer understanding of the link between diet and health.

Functional food and nutraceutical activities

Description of firms

The results of the survey showed that there were an estimated 294 firms in Canada—ranging from small start-ups to multinationals—engaged in activities with functional foods and nutraceuticals in 2002. Ontario counted 75 of these firms, Quebec and British Columbia

2. Health Canada. 1998. "Nutraceuticals/functional foods and health claims on foods." *Therapeutic Products Programme and the Food Directorate from the Health Protection Branch* http://www.hc-sc.gc.ca/food-aliment/ns-sc/ne-en/health_claims-allegations_sante/e_nutra-funct_foods (acccessed on July 30, 2005).

3. Agriculture and Agri-Food Canada. 2002. "The functional food and nutraceutical industry: Innovation profile." *Innovation in Canada.* http://innovation.ic.gc.ca/gol/innovation/site.nsf/en/in02585.html (accessed July 30, 2005).

had 72 each, and Saskatchewan had 33[E4]. The remaining firms were distributed throughout the other provinces.

Small firms (fewer than 10 employees) accounted for 37% of the total number of firms participating in functional foods and nutraceuticals. Medium-sized firms (10 to 49 employees) accounted for 31% and large firms (50 or more employees) for 33%.

More firms were engaged in only nutraceutical activities (46%) than in only functional food activities (28%). Just over one-quarter of firms participated in both. Approximately 60% of small firms were engaged in just nutraceuticals. Medium-sized firms were engaged in either functional foods or nutraceuticals. Large firms were engaged in functional foods, or nutraceuticals, or both.

Some 40% of firms were involved in product development/scale up, over one-third manufactured of consumer ready products and over one-third conducted scientific research and development. Wholesaling was a more frequent activity for firms engaged in nutraceuticals (38%) than for those in functional foods (24%).

Table 1: Participation in functional food and nutraceutical activities, 2002

Activity	Firms that participate with functional foods	Firms that participate with nutraceuticals
	Percentage of firms	
Product development/scale up of new products	41	40
Manufacturer of consumer ready products	37	34
Scientific research and development	34	36
Wholesaler of products	24	38
Manufacturer of ingredients	17	20
Retailer of products	13	18
Provide services (equipment, clinical testing, software) for the industry	3	7
Other	7	10

Note: Percentages do not add to 100 as respondents could choose multiple responses.

Source: Statistics Canada, The Functional Foods and Nutraceuticals Survey - 2002

Participation in functional food and nutraceutical activities

Of firms that produced, distributed or sold nutraceuticals, half (51%) dealt in plant-based nutraceuticals such as beta glucan from oats, antioxidants from blueberries and dried plant materials like echinacea and ginseng; 37% in marine-based nutraceuticals such as

4. The symbol *E* indicates a standard error of between 7.5% and 14.99% or a coefficient of variation (CV) between 15.00% and 29.99%. When the figure is not accompanied by a symbol, the standard error is less than 7.49% or the CV is less than 14.99%. Some data with a higher standard error or CV are precise enough for some purposes.

glucosamine and chitosan products from algae, seaweed and kelp; and 28% in animal or micro organism based nutraceuticals such as elk velvet, essential fatty acids, enzymes and carotenoids.

Among firms that were engaged in functional food activities, 44% added active ingredients to food, such as beta-glucan to muffins, and 14% used special production techniques, such as plant breeding methods, genetic modification and special livestock feeding. These techniques can produce, for example, tomatoes with enhanced lycopene levels, which has been shown to reduce the risk of prostate cancer; strawberries with increased levels of ellagic acid, which has been shown to reduce the risk of heart disease and certain cancers; and omega-3 eggs, which may reduce the risk for cardiovascular disease.

Table 2: Participation of firms, by type of functional food or nutraceutical, 2002

Type of functional food or nutraceutical	Percentage of firms
Nutraceuticals ground, dried, powdered and pressed from plant materials	51
Nutraceuticals extracted or purified from plants	45
Foods that have added active ingredients other than vitamins or minerals and have been scientifically demonstrated to provide health benefits beyond their basic nutritional functions	44
Nutraceuticals produced, extracted or purified from marine sources	37
Nutraceuticals that are produced, extracted or purified from animals and micro-organisms	28
Foods specially enhanced to contain more of a functional component, through plant breeding techniques, genetic modification, processing, or special livestock feeding techniques, that have been scientifically demonstrated to provide health benefits beyond their basic nutritional functions	14
Other	17

Note: Percentages do not add to 100 as respondents could choose multiple responses.
Source: Statistics Canada, The Functional Foods and Nutraceuticals Survey - 2002.

Product lines

Functional foods and nutraceuticals have demonstrated physiological benefits or provide protection against chronic diseases.[5] 'General well being' product lines generated the most revenue for 27% of respondents, and 'vascular heart health' product lines generated the most for 17% of firms.

While 15% of firms offered more than 50 product lines, two-thirds had fewer than 10. Some 57% of firms had product lines available for sale only in Canada and approximately one-

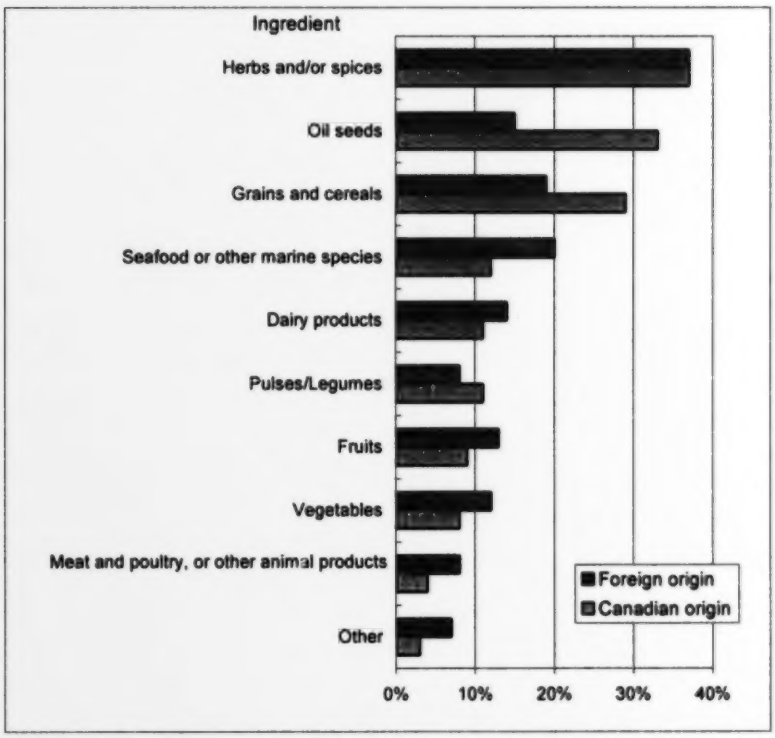
5. Health Canada. 1998. "Nutraceuticals/functional foods and health claims on foods." *Therapeutic Products Programme and the Food Directorate of the Health Protection Branch.* (accessed July 30, 2005).

third of firms offered fewer than 10 product lines for sale only in Canada. One-quarter of firms sold products for export only.

Ingredients sourced in Canada and abroad

Of firms that used functional food or nutraceutical ingredients, 37% used herbs and/or spices from imported sources. The same percentage of firms used herbs and/or spices from domestic sources. About twice as many firms used domestic oilseeds as used foreign oilseeds. Seafood/marine species and grains/cereals were the next most frequently imported ingredients.

Chart 1: Source of ingredients, 2002



Note: These results are only for those firms that use functional food or nutraceutical ingredients.
Source: Statistics Canada, The Functional Foods and Nutraceuticals Survey - 2002

Distribution of products

Firms used more than one method to distribute functional food and nutraceutical products. Wholesalers were used by 61% of firms, broker or third party distributors by 45%, retailers by 40%, direct sales to final consumers by 39%, Internet sales by 28%, mail orders by 19%, and multilevel marketing / network marketing by 7%.

Exporting products

More than half (57%) of the firms surveyed indicated that they exported their functional food and nutraceutical products. One-quarter of firms sold products for export only.

Export sales/revenues

Over one-third of firms had more than $1 million in total export revenues in 2002. Functional food and nutraceutical products contributed more than $1 million to export revenues for 29% of firms.

Table 3: Total export revenues and total functional food and nutraceutical export revenues, 2002

Revenues	Total export revenues	Functional food and nutraceutical export revenues
	Percentage of firms	
less than $10,000	8	8
$10,000 to $99,000	13	19
$100,000 to $499,000	25	27
$500,000 to $999,999	18	16
$1,000,000 to $4,999,999	22	18
$5,000,000 or greater	14	11

*Note: This question was asked only of firms that indicated that they export functional food and/or nutraceutical products.
Source: Statistics Canada, The Functional Foods and Nutraceuticals Survey - 2002

Export destinations

Functional foods and nutraceutical products were exported to a wide variety of destinations —the United States, Japan, Europe, Asia, and Australia and New Zealand.

Table 4: Countries or regions where functional foods and nutraceuticals were exported, 2002

Country or region	Percentage of firms
United States	77
Japan	23
North and/or South Korea	17
Taiwan	16
Australia and/or New Zealand	15
Hong Kong	12
China	11
United Kingdom	11
Germany	9
Italy	7
Belgium	7
Middle East (excluding Israel)	6
Israel	6
France	6
Mexico	6
Malaysia	5
Switzerland	5
Singapore	4
Czech Republic	4
Philippines	4
Norway	4
Spain	3
Caribbean	2
Other Europe	19
Other	8

*Notes:
This question was asked only of firms that indicated that they export functional food and/or nutraceutical products.
Respondents were asked to provide country of export; however, as a significant proportion responded 'Europe', this region is included in the 'Other Europe' category.
Source: Statistics Canada, The Functional Foods and Nutraceuticals Survey - 2002

In 2002, firms indicated interest in pursuing new markets in China, Japan, and Europe within the next two years. China may be of great interest for functional food and nutraceutical exporters because, between 1995 and 2003, Canada's overall exports to China rose 37% and our imports from China quadrupled. In 1995, Canada's trade deficit with

China was $1.2 billion; by 2003, it was nearly $13.8 billion. Canada, as a large net exporter of resources, has benefited from this surge in demand.[6]

Europe was the region of greatest interest for functional food and nutraceutical exports in 2003 and 2004, perhaps because firms were looking to expand existing European markets.

Table 5: Countries or regions of interest in 2002 for export of functional foods and nutraceuticals in 2003 and 2004

Country or region	Percentage of firms
China	19
Japan	16
United Kingdom	9
Australia and/or New Zealand	8
Mexico	8
Middle East	7
Germany	7
Taiwan	5
Hong Kong	5
Korea	4
Caribbean	3
Hungary	3
Singapore	2
United States	2
Other Europe	28
Other Asia	10
Other	5

*Notes:
This question was asked only of firms that indicated they export functional food and/or nutraceutical products.
Respondents were asked to provide country of export; however, as a significant proportion responded 'Europe' or 'Asia,' these regions have been included as 'Other Europe' and 'Other Asia'.
Source: Statistics Canada, The Functional Foods and Nutraceuticals Survey-2002

Exported products

Of the exporting firms, over three-quarters (77%) exported finished products to be sold at the wholesale or retail level without further processing, and 44% exported raw materials to be used in functional foods and nutraceuticals. One-third exported semi-finished products to be further processed.

6. Statistics Canada. 2004. "Canada's trade with China." *The Daily*, Tuesday June 8, 2004. http://www.statcan.ca/Daily/English/040608/d040608a.htm (accessed July 30, 2005).

Table 6: Exported functional food and nutraceutical products, 2002

Products	Percentage of firms
Finished functional foods/nutraceuticals to be sold at wholesale or retail level without further processing	77
Raw material/ingredients to be used in functional foods/nutraceuticals	44
Semi-finished functional foods/nutraceuticals to be further processed before sale	33
Technology pertaining to the production of functional foods/nutraceuticals	8
Other	2

Note: This question was asked only of firms that indicated they export functional foods and/or nutraceutical products.
Source: Statistics Canada, The Functional Foods and Nutraceuticals Survey - 2002.

Business practices

Ownership

Almost 75% of firms were private corporations, 11% were multi-nationals, 10% were public corporations, and 8% were sole proprietorships. For 86% of firms, the majority of ownership was Canadian; the remaining firms were foreign owned. None were Crown corporations.

Table 7: Ownership structure of firms engaged in functional food and nutraceutical activities, 2002

Ownership structure	Percentage of firms
Private corporation	74
Multi national	11
Public corporation	10
Sole proprietorship	8
Unincorporated partnership	1
Other	3

Note: Percentages do not add to 100 as respondents could choose multiple responses.
Source: Statistics Canada, The Functional Foods and Nutraceuticals Survey - 2002.

Partnerships

While 38% of firms were involved in a partnership in 2002, half indicated that they were seeking new partnerships. Partnerships were formed to conduct scientific research and development, production/manufacturing and to access markets/distribution channels.

Table 8: Reasons for forming partnerships, 2002

Purpose of partnership	Percentage of firms
To conduct scientific research and development	73
Production/manufacturing	58
Access markets/distribution channels	57
Access to intellectual property of partner	32
Regulatory affairs	19
Access capital	14
Access others' patents	6
Other	2

Notes:
Percentages do not add to 100 as respondents could choose multiple responses.
This question was asked only of firms that indicated that they are involved in partnership arrangements.
Source: Statistics Canada, The Functional Foods and Nutraceuticals Survey - 2002

Almost 7 in 10 firms partnered with Canadian based organizations, and almost half partnered with American based organizations. Just over one-third partnered with other foreign based companies.

Contracting out

Almost 4 in 10 firms contracted out functional food and nutraceutical related activities in 2002. Activities contracted out ranged from manufacturing/production (70%) and scientific research and development (51%) to market research (19%) and technical/engineering (16%).

Table 9: Contracting out of functional food and nutraceutical related activities, 2002

Reason for contracting out	Percentage of firms
Manufacturing/production	70
Scientific research and development	51
Sales/marketing	30
Clinical	24
Regulatory/intellectual property	19
Market research	19
Technical/engineering	16
Other	2

*Note: Percentages do not add to 100 as respondents could choose multiple responses.
This question was asked only of firms that indicated they had contracted out in 2002.
Source: Statistics Canada, The Functional Foods and Nutraceuticals Survey - 2002.

Raising capital

More than two-thirds of firms did not attempt to raise any capital in 2002. Of those that attempted to raise capital, 65% were successful. However, almost 60% had been limited or refused a request for capital during 2002. Since firms received capital from more than one source, they may have tried to raise money until all sources were exhausted. Reasons cited by firms for the limitation or refusal of capital included the following:

- capital not available due to market conditions
- functional food and nutraceutical product line was limited in scope
- functional food and nutraceutical products and processes not sufficiently developed
- further product development or proof of concept required
- lender does not fund development products
- lack of intellectual property
- failure to meet lending criteria
- lack of evidence to support projections

Half of all firms were funded by conventional sources, such as banks and initial public offerings (IPOs). Other sources included Canadian based venture capital, angel investors or family, and government sources.

Table 10: Sources of raised capital, 2002

Sources	Percentage of firms
Conventional sources (banks, IPOs)	50
Canadian based venture capital	34
Government sources	33
Angel investors/family	31
Partner from strategic alliances	18
American based venture capital	5
Other foreign based venture capital	4
Other	6

*Notes:
Percentages do not add to 100 as respondents could choose multiple responses.
This question applied to those firms that successfully raised capital.
Source: Statistics Canada, The Functional Foods and Nutraceuticals Survey - 2002.

Most firms raised under $1 million in capital and about half raised their targeted amounts.

Table 11: Capital raised, 2002

Capital amount raised	Percentage of firms
Less than $50,000	17[E]
$50,000–$99,999	15[E]
$100,000–$499,999	18[E]
$500,000–$999,999	26[E]
$1,000,000–$1,999,999	9[E]
$2,000,000 or more	15[E]

Note: This question was asked only of firms that raised capital for functional food and nutraceutical related activities.
Source: Statistics Canada, The Functional Foods and Nutraceuticals Survey - 2002

The most common reasons cited for raising funds were to conduct scientific research and development, to develop or expand production and manufacturing capability, and to expand in existing markets or enter new markets.

Table 12: Purpose for raising or attempting to raise capital, 2002

Purpose	Percentage of firms
Develop or expand production and manufacturing capability	63
Scientific research and development purposes	62
To expand in existing or enter into new markets	61
Commercialize current R&D projects	44
Clinical/regulatory expenses	30
Repay current investors	19
Other	3

Notes:
Percentages do not add to 100 as respondents could choose multiple responses.
This question applied to those firms that successfully raised capital.
Source: Statistics Canada, The Functional Foods and Nutraceuticals Survey - 2002

Intellectual property

A minority of firms received intellectual property rights from another firm (17%) or granted licensing agreements (7%) in 2002. However, almost 40% of firms developed trade secrets and 30% registered trademarks. About 17% had functional food and nutraceutical related patents or pending patents in 2002.

Research and development

Some 36% of firms participated in scientific research and development of nutraceuticals and 34% participated in scientific research and development of functional foods.

According to AAFC, Canadian companies have embraced research through innovative technologies to develop and enhance value-added constituents from both plants and animals. The food and food ingredient sector is a very important part of the Canadian nutrition industry.

Canada has developed an industrial capacity in enhancing the nutritive value and functional properties of crops as well as in value-added processing and extracting nutritionally valuable constituents. For example, Canadian companies have developed specialized fractionation technologies for the processing of raw materials such as legumes, flax, soy, oats and other cereals into starch, protein and fibre.

Canadian companies and researchers specializing in the standardization of herb and plant extracts have developed extraction, isolation, and purification expertise to manufacture herbal products to pharmaceutical standards. Companies have refined analytical methods to verify the potency and bio-activity of herbal extracts and other compounds. Canadian companies have also developed technologies and expertise in the extraction, characterization, stabilization, modification, and enhancement of the flavonoid constituents of fruits.

Impact of regulations

Health Canada has jurisdiction over functional food and nutraceutical product regulations, and the Canadian Food Inspection Agency enforces these regulations. In 2003, Health Canada approved five generic health claims pertaining to the following:

- sodium, potassium and hypertension
- calcium, vitamin D and osteoporosis
- saturated fat, trans fat and heart disease
- vegetables and fruits and some types of cancers
- sugar alcohols and dental caries.

In 2002, over 60% of all firms believed that the ability to use claims about reducing the risk of diseases, generic health claims, and structure and function specific claims would have a positive impact on their domestic sales, their export sales and their ability to compete globally. If firms could make these types of claims, over half believed that they might be willing to conduct research to support them.

Currently, Canada and the United States have different compositional and labelling requirements. Firms indicated that changing compositional and labelling regulations to match the US. standards would positively impact about half of all firms' domestic and export sales as well as their ability to compete globally. About 40% of firms stated that they would be willing to conduct research to support health claims if the labelling regulations were changed while 32% of firms said that this would have no impact on them.

Table 13: Firms' perceptions of how changing compositional and labelling regulations to match U.S. standards would impact areas of business, 2002

Business area	Perceived impact						
	Very negative	Somewhat negative	No impact	Somewhat positive	Very positive	Don't know	Not Applicable
	Percentage of firms						
Domestic sales	3	6	17	22	34	14	3
Export sales	1	4	17	19	31	18	10
Willingness to conduct research to support health claims	1	3	32	16	23	18	8
Ability to compete with global competitors	1	4	17	22	29	19	8

Source: Statistics Canada, The Functional Foods and Nutraceuticals Survey - 2002

Human Resources

More than one-third of firms that engaged in functional food and nutraceutical activities had fewer than 10 employees (small firms), almost one-third had from 10 to 49 employees (medium firms) and one-third had 50 employees or more (large firms).

Table 14: Firms with employees who participate in functional food and nutraceutical related activities, by firm size, 2002

Employees	All firms engaging in functional food and nutraceutical activities	Firms with employees who have functional food and nutraceutical related duties
	Percentage of firms	
Fewer than 10	37	55
10–24	21	27
25–49	10	5
50–99	12	6
100–199	6	2
200–299	2	1
300–499	5	3
500–999	4	1
1000 or more	3	1

Note: Firms reported highest employment level for 2002.

Source: Statistics Canada, The Functional Foods and Nutraceuticals Survey - 2002.

Most companies devoted only a portion of their staff to functional food and nutraceutical activities. More than half of all firms had fewer than 10 employees devoting any time to functional food and nutraceutical related activities and about 5% had more than 300 employees working directly with functional food and nutraceuticals. Another one-quarter had from 10 to 24 employees involved in functional food and nutraceutical activities.

Nearly one-quarter of firms had unfilled functional food and nutraceutical positions. The greatest competency needed was in sales/marketing/advertising. Other required competencies included scientific research and development, production, and quality control. Half of functional foods and nutraceutical firms stated that they did not have sufficient capital or resources to attract candidates. Over one-third of firms stated that candidates lacked the expertise required, one-quarter reported that candidates wanted compensation that was too high and another one-quarter reported that candidates were unwilling to relocate.

Table 15: Human resource competencies needed for unfilled functional food and nutraceutical positions, 2002

Competencies needed	Percentage of firms
Sales/marketing/advertising	70
Scientific research and development	46
Production	45
Quality control	38
Regulatory/intellectual property	35
Technical/engineering	26
Business development	23
Management/finance	20
Clinical affairs	10
Other	4

Note: Percentages do not add to 100 as respondents could choose multiple responses.

Source: Statistics Canada, The Functional Foods and Nutraceuticals Survey - 2002

Possible consequences of not being able to hire employees included developing partnerships, contracting out, and raising capital to fulfill a firm's needs for marketing and sales, research and development, and manufacturing.

Challenges for the future

The Functional Foods and Nutraceuticals Survey has provided first-ever information on the size and structure of Canadian firms engaged in activities related to functional foods and nutraceuticals, an emerging part of Canada's food sector. These firms have the potential to expand, and further research is needed to document the trends and growth by categories. These results will serve to guide future policy and investment decisions related to functional food and nutraceutical products.

Bibliography

Agriculture and Agri-Food Canada, Innovation in Canada: The Functional Food and Nutraceutical Industry, Innovation Profile, July 2002.
Available: http://innovation.ic.gc.ca/gol/innovation/site.nsf/en/in02585.html (accessed on July 30, 2005).

Health Canada, *Therapeutic Products Programmes and the Food Directorate of the Health Protection Branch*, (1998). Nutraceuticals/functional foods and health claims on foods.
Available: http://www.hc-sc.gc.ca/food-aliment/ns-sc/ne-en/health_claims-allegations_sante/e_nutra-funct_foods (accessed on July 30, 2005).

Canadian Gazette, Vol. 137, No. 1 — January 1, 2003
FOOD AND DRUGS ACT, *Regulations Amending the Food and Drug Regulations Nutrition Labelling, Nutrient Content Claims and Health Claims*
http://canadagazette.gc.ca/partII/2003/20030101/html/sor11-e.html (accessed on July 31, 2005).

Statistics Canada, *The Daily*, Tuesday June 8, 2004. Canada's Trade with China.
http://www.statcan.ca/Daily/English/040608/d040608a.htm (accessed July 5, 2005).

Methodology

Survey population

AAFC provided Statistics Canada's Small Business and Special Surveys Division with a list of firms involved in activities related to functional foods and nutraceuticals. Statistics Canada's Science, Innovation and Electronic Information Division provided a list of companies that had indicated in the 2001 Canadian Biotechnology Survey that they were involved in functional food and/or nutraceutical related activities. These two lists were merged and duplicate units were identified. The final sample size for the survey was 576 firms.

Responding to this survey is voluntary. Data are collected directly from survey respondents.

The response rate for this survey was 48%.

Sampling

From 576 potential in-scope respondents, the survey had 276 responding questionnaires. A total of 147 of these respondents indicated involvement in functional food and nutraceutical activities. The remaining questionnaires were a mix of non-respondents, company deaths and out-of-scope businesses.

Data quality and Standard error

The standard error is a commonly used statistical measure indicating the sampling error of an estimate. The standard error and the coefficient of variation (standard error expressed as a percentage of the estimate) were used in the tables to provide an indication of the level of data quality of the estimate.

The symbol ^{E} indicates a standard error of between 7.50% and 14.99% or a coefficient of variation (CV) between 15.00% and 29.99%. Some data with a higher standard error or CV are precise enough for some purposes; however one should proceed with caution.

Reliable figures were not obtained through this survey for total sales, sales from functional foods and nutraceuticals, sales revenues, total spending on scientific research and development and total spending on functional food and nutraceutical research and development. As many respondents did not complete these questions, the standard error was too high for the numbers to be published.

Catalogued publications

Statistical publication

88-202-XIE Industrial Research and Development, 2004 Intentions (with 2003 preliminary estimates and 2002 actual expenditures)

88-204-XIE Federal Scientific Activities, 2003-2004[e] (annual)

88-001-XIE Science Statistics (monthly)

Volume 28

No. 1 Estimation of research and development expenditures in the higher education sector, 2001-2002

No. 2 Total spending on research and development in Canada, 1990 to 2003[p], and provinces, 1990 to 2001

No. 3 Distribution of federal expenditures on science and technology by province and territories, 2001-2002

No. 4 Research and Development (R&D) expenditures of Private Non-Profit (PNP) organizations, 2002

No. 5 The provincial research organizations, 2001

No. 6 Scientific and technological (S&T) activities of provincial governments, 1994-95 to 2002-03

No. 7 Biotechnology scientific activities in selected federal government departments and agencies, 2002-2003

No. 8 Estimates of total spending on research and development in the health field in Canada, 1988 to 2003

No. 9 Industrial Research and Development, 2000 to 2004

No. 10 Estimation of Research and Development Expenditures in the Higher Education Sector, 2002-2003

No. 11 Federal government expenditures on scientific activities, 2004-2005[p]

No. 12 Total spending on research and development in Canada, 1990 to 2004[p], and provinces, 1990 to 2002

Volume 29

No. 1 Distribution of federal expenditures on science and technology by province and territories, 2002-2003

No. 2 Research and development (R&D) personnel in Canada, 1993 to 2002

No. 3 Biotechnology scientific activities in federal government departments and agencies, 2003-2004

No. 4 Industrial Research and Development, 2001 to 2005

No. 5 Estimates of total spending on research and development in the health field in Canada, 1988 to 2004

Working papers - 1998

These working papers are available from the Science and Innovation Surveys Section of Statistics Canada, please contact:

Science and Innovation Surveys Section
Science, Innovation and Electronic Information Division
Statistics Canada
Ottawa, Ontario
K1A 0T6

ST-98-01	A Compendium of Science and Technology Statistics, February 1998
ST-98-02	Exports and Related Employment in Canadian Industries, February 1998
ST-98-03	Job Creation, Job Destruction and Job Reallocation in the Canadian Economy, February 1998
ST-98-04	A Dynamic Analysis of the Flows of Canadian Science and Technology Graduates into the Labour Market, February 1998
ST-98-05	Biotechnology Use by Canadian Industry – 1996, March 1998
ST-98-06	An Overview of Statistical Indicators of Regional Innovation in Canada: A Provincial Comparison, March 1998
ST-98-07	Federal Government Payments to Industry 1992-93, 1994-95 and 1995-96, September 1998
ST-98-08	Bibliometric Analysis of Scientific and Technological Research: A User's Guide to the Methodology, September 1998

ST-98-09 Federal Government Expenditures and Personnel on Activities in the Natural and Social Sciences, 1989-90 to 1998-99[e], September 1998

ST-98-10 Knowledge Flows in Canada as Measured by Bibliometrics, October 1998

ST-98-11 Estimates of Canadian Research and Development Expenditures (GERD), Canada, 1987 to 1998[e], and by Province 1987 to 1996, October 1998

ST-98-12 Estimation of Research and Development Expenditures in the Higher Education Sector, 1996-97, November 1998

Working papers - 1999

ST-99-01 Survey of Intellectual Property Commercialization in the Higher Education Sector, 1998, February 1999

ST-99-02 Provincial Distribution of Federal Expenditures and Personnel on Science and Technology, 1988-89 to 1996-97, June 1999

ST-99-03 An Analysis of Science and Technology Workers: Deployment in the Canadian Economy, June 1999

ST-99-04 Estimates of Gross Expenditures on Research and Development in the Health Field in Canada, 1970 to 1998[e], July 1999

ST-99-05 Technology Adoption in Canadian Manufacturing, 1998, August 1999

ST-99-06 A Reality Check to Defining E-Commerce, 1999, August 1999

ST-99-07 Scientific and Technological Activities of Provincial Governments, 1990-1991 to 1998-1999[e], August 1999

ST-99-08 Estimates of Canadian Research and Development Expenditures (GERD), Canada, 1988 to 1999[e], and by Province, 1988 to 1997, November 1999

ST-99-09 Estimation of Research and Development Expenditures in the Higher Education Sector, 1997-98

ST-99-10 Measuring the Attractiveness of R&D Tax Incentives: Canada and Major Industrial Countries, December 1999

Working papers - 2000

ST-00-01 Survey of Intellectual Property Commercialization in the Higher Education Sector, 1999
April 2000

ST-00-02 Federal Government Expenditures and Personnel in the Natural and Social Sciences, 1990-91 to 1999-2000[e], July 2000

ST-00-03 A Framework for Enhanced Estimations of Higher Education and Health R&D Expenditures, by Mireille Brochu, July 2000

ST-00-04 Information and Communications Technologies and Electronic Commerce in Canadian Industry, 1999, November 2000

Working papers - 2001

ST-01-01 Estimates of Canadian Research and Development Expenditures (GERD), Canada, 1989 to 2000[e], and by Province 1989 to 1998, January 2001

ST-01-02 Estimation of Research and Development Expenditures in the Higher Education Sector, 1998-99, January 2001

ST-01-03 Innovation, Advanced Technologies and Practices in the Construction and Related Industries: Provincial Estimates, 1999, January 2001

ST-01-04 Innovation, Advanced Technologies and Practices in the Construction and Related Industries: National Estimates, 1999, February 2001

ST-01-05 Provincial Distribution of Federal Expenditures and Personnel on Science and Technology 1990-91 to 1998-99, February 2001

ST-01-06 Estimates of Total Expenditures on Research and Development in the Health Field in Canada, 1988 to 2000[e], March 2001

ST-01-07 Biotechnology Use and Development, 1999, March 2001

ST-01-08 Federal Government Expenditures and Personnel in the Natural and Social Sciences, 1991-92 to 2000-2001[e], April 2001

ST-01-09 Estimates of Research and Development Personnel in Canada, 1979 to 1999[e], June 2001

ST-01-10 Innovation in Canadian Manufacturing: National Estimates, 1999, June 2001

ST-01-11 Practices and Activities of Canadian Biotechnology Firms: Results from the Biotechnology Use & Development Survey -- 1999, August 2001

ST-01-12 Canadian Biotechnology Industrial Activities: Features from the 1997 Biotechnology Survey, September 2001

ST-01-13 Innovation in Canadian Manufacturing: Provincial Estimates, 1999, September 2001

ST-01-14 Estimates of Canadian Research and Development Expenditures (GERD), Canada, 1990 to 2001[e], and by Province, 1990 to 1999, November 2001

ST-01-15 Estimation of Research and Development Expenditures in the Higher Education Sector, 1999-2000, December 2001

Working papers - 2002

ST-02-01 Innovation and Change in the Public Sector: A Seeming Oxymoron, January 2002

ST-02-02 Measuring the Networked Economy, March 2002

ST-02-03 Use of Biotechnologies in the Canadian Industrial Sector: Results from the Biotechnology Use & Development Survey - 1999, March 2002

ST-02-04 Profile of Spin-off Firms in the Biotechnology Sector: Results from the Biotechnology Use and Development Survey - 1999, March 2002

ST-02-05 Scientific and Technological Activities of Provincial Governments 1992-1993 to 2000-2001[e], April 2002

ST-02-06 Are we Managing our Knowledge? Results from the Pilot Knowledge Management Practices Survey, 2001, April 2002

ST-02-07 Estimates of Total Expenditures on Research and Development in the Health Fields in Canada, 1988 to 2001[p], May 2002

ST-02-08 Provincial Distribution of Federal Expenditures and Personnel on Science and Technology, 1991-92 to 1999-2000, May 2002

ST-02-09 An Overview of Organisational and Technological Change in the Private Sector, 1998-2000, June 2002

ST-02-10 Federal Government Expenditures and Personnel in the Natural and Social Sciences, 1992-1993 to 2001-2002[p], June 2002

ST-02-11 Innovation in the Forest Sector, June 2002

ST-02-12 Survey of Innovation 1999, Methodological Framework: Decisions Taken and Lessons Learned, June 2002

ST-02-13 Innovation and the Use of Advanced Technologies in Canada's Mineral Sector: Metal Ore Mining, July 2002

ST-02-14 Estimation of Research and Development Expenditures in the Higher Education Sector, 2000-2001, December 2002

ST-02-15 Estimates of Canadian Research and Development Expenditures (GERD), Canada, 1991 to 2002[p], and by Province 1991 to 2000, December 2002

ST-02-16 Survey of Innovation 1999, Statistical Tables, Manufacturing Industries, Canada, December 2002

ST-02-17 Determinants of Product and Process Innovations in Canada's Dynamic Service Industries, December 2002

Working papers - 2003

ST-03-01 A Comparison of International R&D Performance: An Analysis of Countries That Have Significantly Increased Their GERD/GDP Ratios During the Period 1989-1999, February 2003

ST-03-02 Who's Sharing What With Whom? How Canadian Businesses Used Electronic Networks to Share Information in 2001, February 2003

ST-03-03 How is the Canadian Biotechnology Evolving: A Comparison of the 1997 and 1999 Biotechnology Use and Development Surveys, March 2003

ST-03-04 Scientific and Technological Activities of Provincial Governments, 1993-1994 to 2001-2002[e], March 2003

ST-03-05 Features of Canadian biotech innovative firms: results from the biotechnology use and development survey - 2001, March 2003

ST-03-06 Innovation is a social process, March 2003

ST-03-07 Knowledge management in practice in Canada, 2001, March 2003

ST-03-08 Provincial distribution of federal expenditures and personnel on science and technology, 1994-95 to 2000-2001, April 2003

ST-03-09 Federal government expenditures and personnel in the natural and social sciences, 1993-1994 to 2002-2003, April 2003

ST-03-10 Estimates of total expenditures on research and development in the health field in Canada, 1988 to 2002[p], November 2003

ST-03-11 Estimates of research and development personnel in Canada, 1979 to 2000, November 2003

ST-03-12 Survey of intellectual property commercialization in the higher education sector, 2001, November 2003

ST-03-13 Bioproducts development by Canadian biotechnology firms: findings from the 2001 Biotechnology Use and Development Survey, December 2003

Working papers - 2004

ST-04-01 Starting the new century: technological change in the Canadian private sector, 2000-2002, January 2004

ST-04-02 Estimation of research and development expenditures in the higher education sector, 2001-2002, January 2004

ST-04-03 Estimates of Canadian research and development expenditures (GERD), Canada, 1992 to 2003[p], and by province 1992 to 2001, January 2004

ST-04-04 The many guises of innovation: what we have learnt and where we are heading, 2003, January 2004

ST-04-05 Provincial distribution of federal expenditures and personnel on science and technology, 1995-96 to 2001-2002, February 2004

ST-04-06 Biotechnology use and development survey: methodology, issues and responses, February 2004

ST-04-07 An historical comparison of technological change, 1998-2000 and 2000-2002, in the private and public sectors, March 2004

ST-04-08 Technological change in the public sector, 2000-2002, March 2004

ST-04-09 Regional disparities of research and development in the business services sector, April 2004

ST-04-10 Innovative firms: A look at small firms, May 2004

ST-04-11 Scientific and technological activities of provincial governments, 1994/95 to 2002/2003, June 2004

ST-04-12 Federal government payments to industry, 1997-1998 to 2001-2002, July 2004

ST-04-13 Community innovation: Industrial specialization in Canadian cities, July 2004

ST-04-14 Estimates of total expenditures on research and development in the health field in Canada, 1988 to 2003, July 2004

ST-04-15 Community innovation: innovation performance of manufacturing firms in Canadian communities, September 2004

ST-04-16 List of papers published by Kluwer Academic Publishers, in the Economics of Science, Technology and Innovation Series, October 2004

ST-04-17 Trends in Canadian biotechnology activity: 1997 to 2001, October 2004

ST-04-18 Public sector technology transfer in Canada, 2003, November 2004

ST-04-19 Estimation of research and development expenditures in the higher education sector, 2002-2003, November 2004

ST-04-20 Estimates of Canadian research and development expenditures (GERD), Canada, 1993 to 2004^{p}, and by province 1993 to 2002, December 2004

ST-04-21 Characteristics of firms that grow from small to medium size: growth factors--interviews and measurability, 1999, December 2004

ST-04-22 Characteristics of firms that grow from small to medium size: innovation and growth in small manufacturing firms, 1997 to 1999, December 2004

Working papers - 2005

ST-05-01 Federal government expenditures and personnel in the natural and social sciences, 1995/96 to 2004/05, January 2005

ST-05-02 Provincial distribution of federal expenditures and personnel on science and technology, 1996-97 to 2002-03, January 2005

ST-05-03	Industrial R&D statistics by region, 1994 to 2002, January 2005
ST-05-04	Knowledge sharing succeeds: how selected service industries rated the importance of using knowledge management practices to their success, February 2005
ST-05-05	Characteristics of firms that grow from small to medium size: Industrial and geographic distribution of small high-growth firms, February 2005
ST-05-06	Summary: Joint Statistics Canada – University of Windsor workshop on intellectual property commercialization indicators, Windsor, November 2004, March 2005
ST-05-07	Summary: Meeting on commercialization measurement, indicators, gaps and frameworks, Ottawa, December 2004, March 2005
ST-05-08	Estimates of research and development personnel in Canada, 1979 to 2002, April 2005
ST-05-09	Overview of the Biotechnology Use and Development Survey – 2003, April 2005
ST-05-10	Access to Financing Capital by Canadian Innovative Biotechnology Firms, April 2005
ST-05-11	Scientific and technological (S&T) activities of provincial governments and provincial research organizations, 1995-96 to 2003-04, September 2005

Research papers – 1996-2002

No. 1	The State of Science and Technology Indicators in the OECD Countries, by Benoit Godin, August 1996
No. 2	Knowledge as a Capacity for Action, by Nico Stehr, June 1996
No. 3	Linking Outcomes for Workers to Changes in Workplace Practices: An Experimental Canadian Workplace and Employee Survey, by Garnett Picot and Ted Wannell, June 1996
No. 4	Are the Costs and Benefits of Health Research Measurable?, by M.B. Wilk, February 1997
No. 5	Technology and Economic Growth: A Survey, by Petr Hanel and Jorge Niosi, April 1998
No. 6	Diffusion of Biotechnologies in Canada, by Anthony Arundel, February 1999
No. 7	Barriers to Innovation in Services Industries in Canada, by Pierre Mohnen and Julio Rosa, November 1999
No. 8	Explaining Rapid Growth in Canadian Biotechnology Firms, by Jorge Niosi, August 2000

No. 9 Internationally Comparable Indicators on Biotechnology: A Stocktaking, a Proposal for Work and Supporting Material, by W. Pattinson, B. Van Beuzekom and A. Wyckoff, January 2001

No. 10 Analysis of the Survey on Innovation, Advanced Technologies and Practices in the Construction and Related Industries, 1999, by George Seaden, Michael Guolla, Jérôme Doutriaux and John Nash, January 2001

No. 11 Capacity to Innovate, Innovation and Impact: The Canadian Engineering Services Industry, by Daood Hamdani, March 2001

No. 12 Patterns of Advanced Manufacturing Technology (AMT) Use in Canadian Manufacturing: 1998 AMT Survey Results, by Anthony Arundel and Viki Sonntag, November 2001